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Application No.	S2002/0832
Date of Filing	24 October 2002
Applicant	JOHN GERARD CRONIN, an Irish Citizen of 6 Ashbrook, Carrigtohill, County Cork, Ireland.

Dated this 4th day of November 2003.

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S020852

ORM NO. 1

REQUEST FOR THE GRANT OF A PATENT

PATENTS ACT 1992

The Applicant(s) named herein hereby request(s)
[ ] the grant of a patent under Part II of the Act
[X] the grant of a short-term patent under Part III of the Act
on the basis of the information furnished hereunder.

1. Applicant(s)

CRONIN John Gerard
6 Ashbrook
Carrigtohill
County Cork
Ireland
an Irish Citizen

2. Title of Invention
A method of using household waste in the production of concrete

3. Declaration of Priority on basis of previously filed application(s) for same invention (Sections 25 & 26)

Previous Filing Date	Country in or for which filed	Filing No.

4. Identification of Inventor(s)

Name(s) and addresse(s) of person(s) believed by the Applicant(s) to be the inventor(s)
John Gerard Cronin
an Irish Citizen of 6 Ashbrook, Carrigtohill, County Cork, Ireland

Statement of right to be granted a patent (Section 17(2) (b))

6. Items accompanying this Request

(i)	[X]	prescribed filing fee (Euro 60.00)
(ii)	[ ]	specification containing a description and claims
	[X]	specification containing a description only
	[X]	Drawings referred to in description or claims
(iii)	[ ]	An abstract
(iv)	[ ]	Copy of previous application(s) whose priority is claimed
(v)	[ ]	Translation of previous application whose priority is claimed
(vi)	[X]	Authorisation of Agent (this may be given at 8 below if this Request is signed by the Applicant(s))

7. Divisional Application(s)
The following information is applicable to the present application which is made under Section 24 -

Earlier Application No.
Filing Date:

8. Agent

The following is authorised to act as agent in all proceedings connected with the obtaining of a patent to which this request relates and in relation to any patent granted -

Name & Address

Cruickshank & Co. at their address recorded for the time being in the Register of Patent Agents is hereby appointed Agents and address for service, presently 1 Holles Street, Dublin 2.

9. Address for service (if different from that at 8)

Signed Cruickshank & Co.

By:- Executive.

Agents for the Applicant

Date October 24, 2002.

APPLICATION NO. S020852

"A method of using household waste in the production of concrete"

Introduction

This invention relates to a method of using household waste in the production of concrete. Reference is made to the applicant's own co-pending Irish and European Patent Applications entitled "A method of using wastewater sludge in the production of concrete", having the same filing date as the present application, the content and disclosure thereof being incorporated herein by reference.

Nowadays, people are becoming more aware of the need to recycle their refuse in an environmentally friendly manner. Local authorities and other companies that have been entrusted with refuse disposal have begun implementing extensive recycling programmes whereby much of the refuse to be disposed of is separated off and sent to dedicated recycling plants for re-use. Typically, glass, paper and other such products have been separated from the remaining refuse and sent for recycling. Other waste such as household waste and in particular biodegradable household waste is usually subjected to further treatments before being sent to landfill, incineration or dumping at sea. Generally speaking though, these methods of disposal are often relatively expensive and various separate environmental issues arise from each method of disposal.

Another solution suggested for the treatment of biodegradable household waste is composting. The waste is stored for a prolonged period of time, usually over six weeks, and allowed to decompose. The decomposed waste may then be used as compost for agricultural or horticultural purposes. This allows for the waste to be recycled in an environmentally friendly manner. There are, however, problems associated with this known method of recycling biodegradable household waste. The first problem with this method is the noxious smell that is released by the biodegradable household waste as it decomposes. This can be quite overpowering and often leads to complaints and disputes with neighbouring residents. To contain the noxious smell from the decomposing matter, the composting is frequently carried out in negative pressure sheds so that the smell affects the surrounding environment as little as possible. However, these sheds are quite expensive to provide and further

increase the cost of recycling the biodegradable household waste. Furthermore the entire process is quite lengthy and time consuming to complete.

It is an object therefore of the present invention to provide a method of recycling household waste and in particular, biodegradable household waste in an environmentally friendly manner that is both simple and inexpensive to implement and that overcomes at least some of the difficulties of the prior art.

Statements of Invention

According to the invention, there is provided a method of using household waste in the production of concrete comprising the steps of:-

(a) mixing the household waste with an alkaline solution to form a household waste sludge mixture;

(b) mixing cement and aggregate together to form a dry mix;

(c) blending the dry mix, the household waste sludge mixture, and water if necessary, to form a concrete mixture.

By using this method, the household waste will be incorporated into a concrete which may be used for construction or other such purposes. The household waste will not have to undergo lengthy composting and will not have to be incinerated or dumped at sea or on land. A useful method of reusing the biodegradable matter is achieved that is both simple and inexpensive to implement. Furthermore, by adding an alkaline solution, any harmful or toxic bacteria or viruses present in the concrete will be killed and the risk of subsequent leaching from the concrete of harmful materials is much reduced.

In another embodiment of the invention, there is provided a method of using household waste in the production of concrete, in which the pH of the alkaline solution is between 12.5 and 14. Preferably, the pH of the alkaline solution is between 13.5 and 14. By having a high pH alkaline solution, a more efficient kill of bacteria in the

biodegradable matter is achieved and a concrete that will not present an environmental danger will be provided.

In a further embodiment of the invention, the alkaline solution is a concrete hardener. It has been found that a concrete hardener may act as the alkaline solution and kill bacteria present in the concrete mixture. Furthermore, the concrete hardener will help to harden the concrete mixture in due course and will not have a detrimental effect on the quality of the concrete produced.

In one embodiment of the invention, a bonding agent is added to the concrete mix. Preferably, the bonding agent used is carboxylated styrene butadlene alkali and will have a pH in the region of 8 to 11. By adding a bonding agent to the concrete, there will be provided better adhesion of the component particles in the concrete, also improving the pH properties of the concrete.

In another embodiment of the invention, a polymer is added to the wastewater sludge. The polymer will further act as a bonding agent for the concrete providing improved adhesion properties of the concrete's components.

In a further embodiment of the invention, the aggregate comprises one or more of grey wacke stone, sand, sandstone, gravel, limestone, crushed shale, crushed seashells, pencil, kiln dried sand, grit, pulverised fuel ash, slag from steelworks, quicklime and recycled crushed concrete.

In one embodiment of the invention, additional cement is used, instead of aggregate, in the concrete mixture. This may, in some instances, be more economical than providing further aggregates, while also providing a usable concrete mixture that contains a high content of biodegradable household waste.

In another embodiment of the invention, a detergent is added to the concrete mix prior to curing. By providing the detergent, further bacterial kill may be achieved, again providing a concrete suitable for use in goods and products that conform to health and safety standards.

In a further embodiment of the invention, household waste comprises between 5% and 50% of the concrete mixture. Alternatively, the household waste may comprise between 10% and 40% of the concrete mixture. Preferably, the household waste will comprise between 20% and 30% of the concrete mixture. This allows for a large quantity of household waste to be incorporated into the concrete, while still maintaining all the strength properties necessary in the concrete to be used in the construction.

In one embodiment of the invention, there is provided a process of recycling biodegradable household waste comprising the steps of:-

(a) separating refuse into a plurality of refuse types;

(b) retrieving the biodegradable household waste refuse and sending this refuse to a shredder;

(c) shredding the biodegradable household waste refuse;

(d) adding water to the shredded refuse, if required;

(e) adding an alkali solution to the shredded biodegradable household refuse forming a household waste sludge mixture;

(f) in a separate container, mixing a quantity of cement with a desired quantity of aggregate to form a dry mix;

(g) adding the household waste sludge mixture to the dry mix; and

(h) blending the household waste sludge mixture with the dry mix to form concrete.

This is seen as a particularly useful method of recycling household waste and in particular, biodegradable household waste.

Detailed Description of the Invention

The invention will now be more clearly understood from the following description of some embodiments thereof, given by way of example only, with reference to the accompanying drawings, in which:-

Fig. 1 is a diagrammatic illustration of one form of suitable apparatus that may be used for carrying out the invention;

Fig. 2 is a block diagram of the process of recycling household waste according to the invention; and

Fig. 3 is a diagrammatic view of a typical plant layout suitable for performing the process according to the invention.

Referring to the drawings and initially to Fig. 1 thereof, there is shown a diagrammatic illustration of one form of suitable apparatus for carrying out the method. Shredded household waste is fed from a container 1 to a mixing truck 2 by way of conveyor 3. A conveyor 3 has load cells (not shown) connected thereto to carefully monitor the amount of household waste being delivered to the mixing truck 2. The household waste is placed in a paddle mixer 4 of the mixing truck 2 wherein it is mixed with an alkali solution to form a household waste sludge mixture. Additional water may be added to the shredded household waste and alkali solution, if necessary. Once the household waste and alkali solution have been mixed sufficiently, a pump 5 on mixing truck 2 is actuated to pump the household waste and alkali mixture through a flexible hosepipe 6 to a mixing drum 7 of a nearby concrete mixing truck 8. The mixing drum 7 has already contained therein, a thoroughly blended mixture of cement and aggregate. Once the household waste sludge mixture has been added to the mixing drum 7 containing the aggregate and cement, the mixing drum 7 is rotated, thereby blending the materials contained therein to form a concrete mixture. Additional water may be added to the aggregate, cement and household waste sludge mixture, if necessary.

The relative amounts of household waste, cement and aggregate are determined, depending on the strength and curing time requirements of the individual producing the concrete. The alkali solution blended with the household waste can be a concrete hardener such as that sold under the brand name Sika [Registered

Trade Mark (RTM)]. The alkali will further act as a hardener assisting in the curing time of the concrete mix once the household waste sludge mixture and the dry mix have been blended together.

In addition to the alkali solution, a bonding agent such as those sold under the Registered Trade Marks EVOSTICK, RONAFIX or POLYVINYL ACETATE is further added to the household waste sludge mixture to improve the pH value of the concrete to be produced, whilst also improving the bonding properties of each of the main components in the concrete. This concrete mix may then be used to construct road side barriers, concrete verges, and the like. Indeed, the concrete produced may be crushed and used as an aggregate for further concrete, made in accordance with this method.

Referring now to Fig. 2 of the drawings, there is shown a block diagram of the process of recycling household waste according to the invention. In step 20, refuse is received at the refuse disposal depot. In step 22, this refuse is separated by hand or other means into various different types of refuse, including glass, plastics, paper and other biodegradable matter. In step 24, the biodegradable matter is placed in a shredder where the matter is broken up into smaller pieces. Water may then be added in step 26 to the shredded biodegradable waste material, if desired. In step 28, an alkali solution is added to the biodegradable waste material to further sanitise the biodegradable waste and form a household waste sludge mixture.

In step 30, in a separate mixing tank, cement and aggregate are mixed together thoroughly to form a dry mix. The biodegradable household waste sludge mixture is introduced into the separate mixing tank with the dry mix, in step 32, and they are blended together to form a concrete mixture in step 34. Additional water may be added if required. The concrete is then ready to be poured and made into concrete products or other similar articles.

A liquid detergent such as those produced by JEYES (RTM), DETTOL (RTM) or FLASH (RTM) may be added to the unsolidified concrete mixture to further eliminate any residual bacteria present in the wastewater sludge. The concrete may then be poured into a heavy duty plastic container and sealed therein to avoid any risk of

contamination to the environment by leaching of the concrete once it has been exposed to the elements.

It is envisaged that the mixing of the cement and aggregate could be performed in a standard concrete mixing truck or in such similar device. The household waste sludge mixture could be added to the dry mix in the concrete mixing truck, once any additional hardening agents or bonding agents have been thoroughly mixed in with the household waste sludge mixture. Reinforcing materials such as glass fibre or steel can also be added as part of the aggregate, further strengthening the concrete produced. As an alternative to a heavy duty plastic container, a fibreglass coating or plastic coating may be applied to concrete produced in accordance with the method to add further protection and additional strength to the concrete.

Referring now to Fig. 3 of the drawings there is shown a diagram of a typical plant layout suitable for performing the process according to the invention. Refuse is taken in, in rubbish intake area 40. The refuse is stored in storage area 41 until ready for processing. When desired, the refuse is passed to hopper/bag ripper 42 and thereafter placed on conveyor belt 43. An over belt magnet 46 extracts any large pieces of metal and deposits them to metal skip 47. Further undesirable pieces of refuse are manually separated at picking station 49. The refuse then proceeds along the conveyor belt to shredder 50 where the refuse is shredded into smaller particles. The shredded refuse continues along conveyor to an over belt Eddie magnet 52 which collects further metal objects such as aluminium cans and deposits them into skip 53. The remaining refuse passes through finger screen blower and sucker 55 and onwards to a high speed mill/shredder 56. Once this is complete the shredded material is passed to the water separation material tank 58 where plastics and wood are skimmed from the mixture. The plastics and wood collected are passed to a dedicated skip 59. The remaining shredded refuse continues to sealed water/sludge tank, with skimmer and agitator, 61. Gases from the sealed water/sludge tank 61 are fed off to gas fire generator 62 for burning and the treated water/sludge is fed through pipe 63 to centrifuge 65 to form sludge cake. Wastewater from the centrifuge step is passed to a treatment plant along pipe 66 with the remaining sludge cake passed to a paddle mixer 67 along pipeline 68. Additives are added to the sludge cake in the paddle mixer 67 before being sent to concrete plant mixer 70 where the sludge cake

that had additives mixed thereto such as an alkali solution is mixed with a dry mix of concrete and aggregate. Finally, the concrete mix is passed to a mould shed (not shown) along pipeline 71. It will be understood that the entire process could be carried out in one large shed or three smaller sheds comprising an intake area, a sorting and shredding area and a concreting plant and manufacturing area linked by pipes or conveyors. The shed(s) could be provided with negative pressure and/or extractor units if necessary.

In this specification, the term "hardening agent" has been used to define a substance that will reduce the time necessary for the concrete mixture to set. The concrete bonding agent is used to describe a substance that is used to enhance the cohesion of the individual ingredients, once mixed. Potassium carbonate or aluminium silicate could act as hardening components. The alkali solution used could be an alkali solution of potassium hydroxide or alternatively sodium hydroxide, calcium hydroxide or barium hydroxide or other similar substance.

In the specification the terms "comprise, comprises, comprised and comprising" or any variation thereof and the terms "include, includes, included and including" or any variation thereof are considered to be totally interchangeable and they should all be afforded the widest possible interpretation and vice versa.

The invention is in no way limited to the embodiments hereinbefore described, but may be varied in both construction and detail.

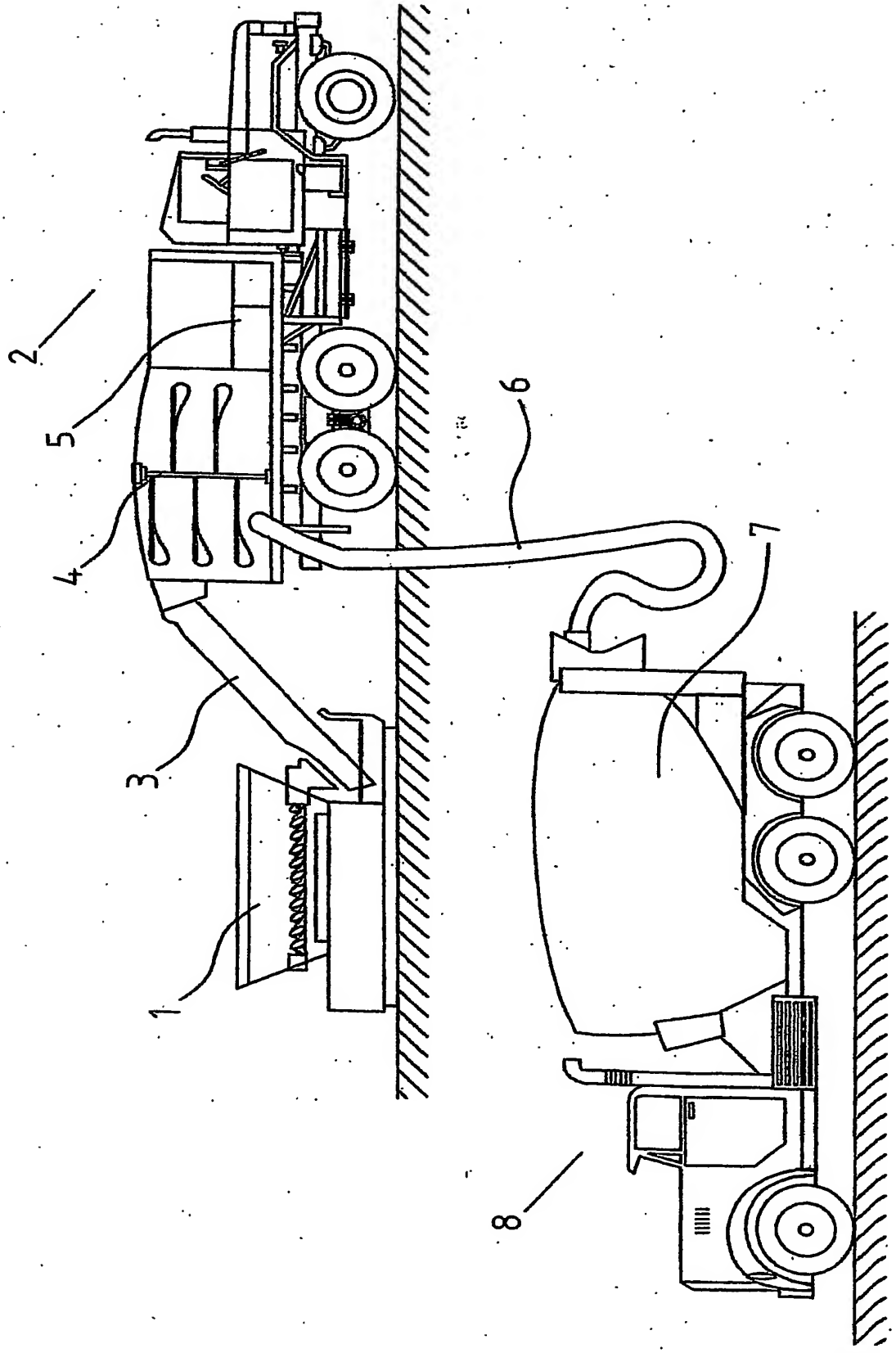

Fig. 1

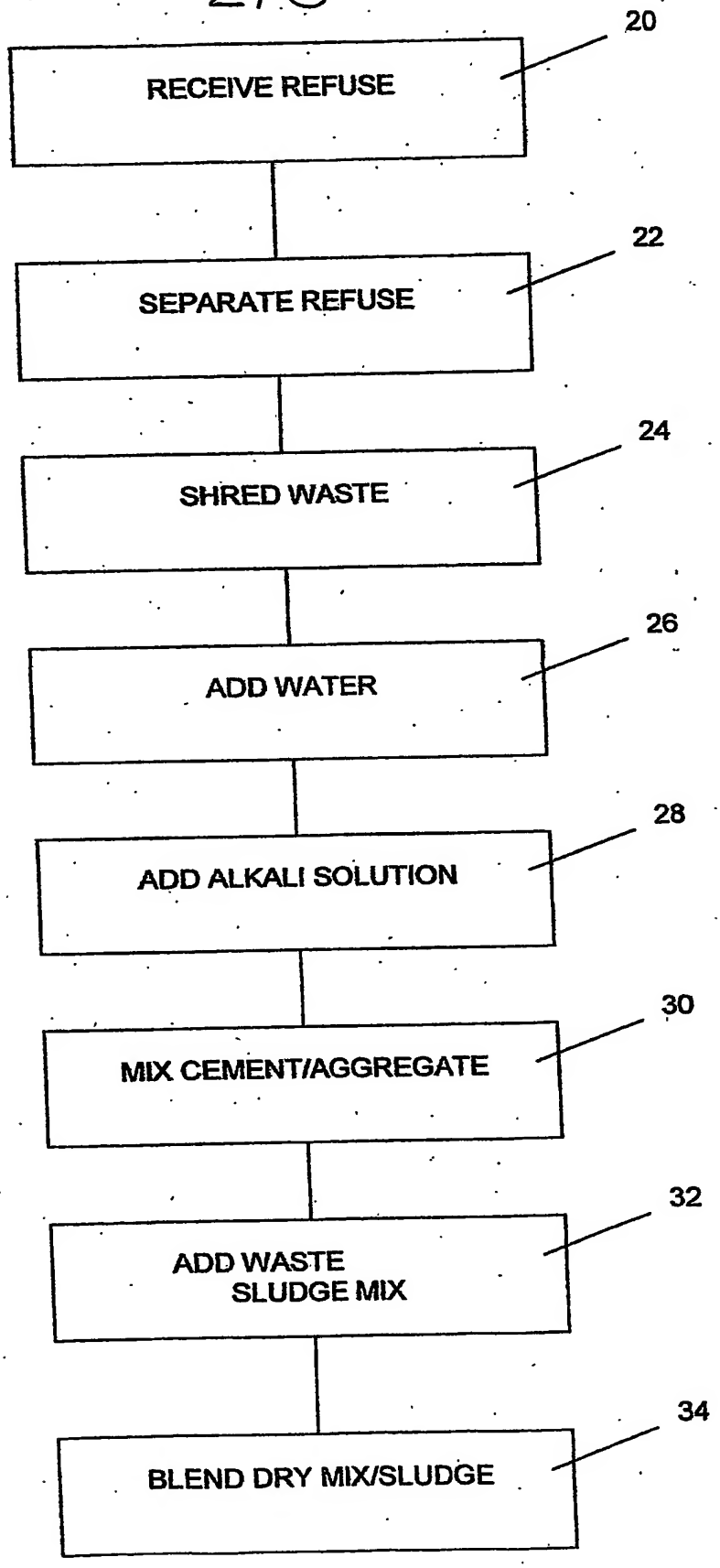
20
RECEIVE REFUSE
22
SEPARATE REFUSE
24
SHRED WASTE
26
ADD WATER
28
ADD ALKALI SOLUTION
30
MIX CEMENT/AGGREGATE
32
ADD WASTE SLUDGE MIX
34
BLEND DRY MIX/SLUDGE

FIG2

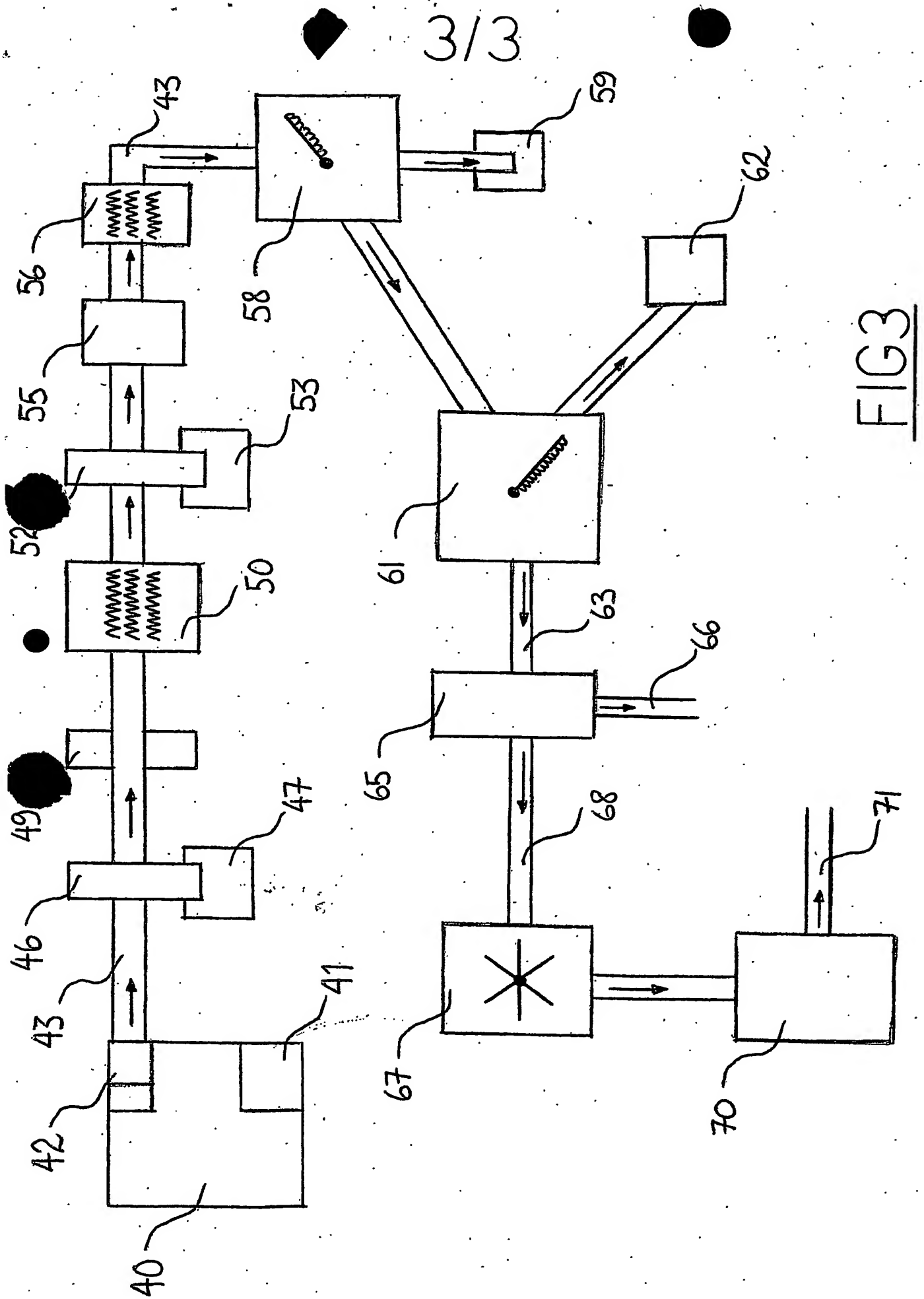

FIG3